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NEW PUBLICATIONS

October - December 1986

ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

240 West Prospect Street **Fort Collins, Colorado 80526**

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CONTIN

GENERAL TECHNICAL REPORTS

45 Patton, David R., Carlos E. Gonzales,* Alvin L. Medina, Luis A. Segura,* and R. H. Hamre (technical coordinators). 1986. Management and utilization of arid land plants. Symposium proceedings. [Saltillo, Mex., February 18-22, 1985]. USDA Forest Service General Technical Report RM-135, 113 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

These proceedings contain 19 papers presented as part of a continuing cooperative effort in forestry and related resources between Mexico and the U.S. Primary species discussed include jojoba, guayule, palms, prickly pear, candelilla, mesquite, buffalo grind, creosotebush, Indian ricegrass, and yerba del manso. Papers in the language of the author (Spanish or English) with an abstract in the other language.

46 Peterson, Roger S.,* and Eric Rasmussen.* 1986. Research natural areas in New Mexico. USDA Forest Service General Technical Report RM-136, 58 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

New Mexico's 17 Research Natural Areas are described. Included are maps, photographs, and brief accounts of administration, climate, physiography, geology, soils, vegetation, fauna, research uses, and references. Threats and intrusions are noted. This information should be useful to scientists interested in conducting botanical or zoological research in New Mexico.

*Federal, state, or private cooperator.

AVAILABLE FROM OTHER SOURCES

The following publications, not available from the Rocky Mountain Station, are available directly from the publisher, or at most university and some public libraries.

Baker, Malchus B., Jr. 1986. A supercritical flume for measuring sediment laden streamflow. Water Resources Bulletin 22(5):847-851.

After 25 years of operation on ephemeral streams in the semiarid Southwest, this supercritical flume has provided more than 350 station-years of reliable streamflow data, even under freeze-thaw conditions experienced at elevations of 1,500 to 2,100 m, in Arizona. The flume has also provided streamflow conditions, where considerable sediment and other debris was moved downstream.

Bjugstad, Ardell J. 1986. Hybrid poplar cultivars for maximizing phytomass production on gold mine tailings in the Black Hills. p. 263-265. In: 1986 National symposium on mining, hydrology, and reclamation [Lexington, Ky., December 8-11, 1986]. University of Kentucky, Lexington.

Twenty-six hybrid poplar clones were planted as cuttings on a gold mine tailings in the Black Hills. Four exhibited very good survival and growth. Other clones had relatively high (exceeding 50 percent) survival but slow growth (below 60 cm) over a 5-year period.

Finch, Deborah M. 1986. Similarities in riparian bird communities among elevational zones in southeastern Wyoming. p. 105-110. In: Proceedings Wyoming 1986 and streamside zone conference [Casper, Wyo., April 28-30, 1986] 181 p. Wyoming Water Research Center, University of Wyoming, Laramie.

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Bird species diversity in Wyoming riparian habitats ranged from 3 bird species and 23 pairs in subalpine habitat to 21 species and 101 pairs in lowland cottonwood habitat. Few subaipine species contained unique avifaunas. Similarity in species composition was greatest within elevational zones.

Fresquez, P. R., Earl F. Aldon, and W. C. Lindemann.* 1986. Changes in microbial populations and enzyme activities resulting from coal mine spoil reclamation. p. 63-70. In: 1986 National symposium on mining, hydrology, sedimentology, and reclamation [Lexington, Ky., December 8-11, 1986]. University of Kentucky, Lexington.

This paper reports on research to determine microbial populations, the diversity and composition of fungal groups, and the activities of enzymes on an undisturbed soil and on eight reclaimed nontopsoiled and topsoiled areas varying in ages.

Hawkes, Clifford L., David L. Miller,* and William G. Layher.* 1986. Fish ecoregions of Kansas: Stream fish assemblage patterns and associated environmental correlations. Environmental Biology of Fishes 17(4):267-279.

Principal components analysis was performed on fish presence/absence data for 39 common fish species from 410 stream sites in Kansas. The analysis confirmed 10 ecologically meaningful fish assemblages, based on species associations. Factor scores based on these assemblages were then clustered into six geographic areas or fish ecoregions. Mean annual runoff, mean annual growing season, and discharge appear most important. The multivariate statistical approach used to classify fish ecoregions should have considerable potential value for fish assessment and management purposes in areas other than Kansas.

Hibbert, A. R., O. D. Knipe, and E. A. Davis. 1986. Streamflow response to control of chaparral shrubs along channels and upper slopes. p. 95-103. In: Chaparral ecosystems research conference [Santa Barbara, Calif., May 16-17, 1985]. California Water Resource Center Report No. 62. University of California, Davis.

Chemical control of channel-side shrubs on 15.4 ha of a chaparral watershed created perennial flow in an intermittent stream and increased annual streamflow on the watershed by 16 mm. No additional increase in streamflow resulted from treatment of 20 ha on the upper slopes of the watershed. Presumably the water saved by reducing transpiration on the upper slopes was lost to downslope shrubs as the soil water migrated toward the channel. Treatments designed to increase water yield in chaparral should be concentrated as near to the channels as possible, consistent with other resource values.

Hof, John G., James B. Pickens, and E. T. Bartlett.* 1986. A maxmin approach to nondeclining yield timber harvest scheduling problems. Forest Science 32(3):653-666.

This paper investigates an alternative approach to scheduling timber harvests when nondeclining yield is desired. The approach maximizes the minimum harvest during any one time period, across all time periods in the planning horizon. This approach tends to create an even flow harvest pattern, but allows more flexibility than rigid nondeclining yield or even flow constraints. The approach is tested in a case study involving conversion of an unregulated forest into a regulated state. The results suggest that the approach, in combination with other approaches, may have the potential to generate useful solutions to this type of timber harvest scheduling problem.

Joyce, Linda A., Thomas W. Hoekstra, and Ralph J. Alig. 1986. Regional multiresource models in a national framework. Environmental Management 10(6):761-771.

A national assessment of all forest and range land resources requires an assessment of the current resource production, an analysis of the future multiresource production based on likely resource management, and an analysis of the future multiresource production based on alternative management scenarios. This paper presents the theoretical background and modeling approach for analyzing multiresource production at a regional scale under a likely future or under alternative management scenarios. Primary models are developed in a framework that integrates the current strengths in single resource modeling efforts to predict the multiresource response to management.

Judson, Arthur, Rudy M. King, and Glen E. Brink. 1986. Multi-basin avalanche simulation: A model. Cold Regions Science and Technology 13:35-47.

A process oriented avalanche prediction model for wide-area use was developed using five winters' data from Berthoud Pass, Colorado. The model was successfully tested on independent data from the Colorado Front Range and San Juan Mountains. This research model is driven by temperature, precipitation, wind, and radiation; it simulates snow transport and deposition in starting zones and the development of a layered snow cover in forest sheltered clearings. Probabilities of avalanche occurrence are estimated according to recent loading and simulated regional snowpack stratigraphy.

Martinelli, M., Jr. 1986. A test of the avalanche runout equations developed by the Norwegian Geotechnical Institute. Cold Regions Science and Technology 13:19-33.

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Equations developed in Norway to predict average gradient (runout distance) from terrain parameters were tested against a sample of North American and Swiss avalanches. Average gradient was predicted within $\pm 2^{0}$ for about 70% of the cases. Runout distances were generally underestimated for paths with a unique longitudinal profile. A new equation that can handle both the normal and the troublesome profiles was developed from the test data.

Medina, Alvin L. 1986. Riparian plant communities and soils of the Fort Bayard watershed in southwestern New Mexico. The Southwestern Naturalist 31(3):345-359.

Cluster analysis was used to classify the riparian vegetation of the Fort Bayard watershed into eight plant communities. Communities identified represent residual vegetation after a severe grazing and deforestation impact. *Populus* and *Juglans* communities persisted on mostly shallow, recently deposited Ustifluvents of lower elevations. At higher elevations, *Acer* and *Alnus* communities occurred on moderate to very deep Ustifluvents of Haplustolls. *Populus* and *Salix* showed poor reproduction under dense canopies which suggested they were pioneer species. Soils were found to be Mollic Ustifluvents, Aquic Ustifluvents, Aquic Haplustolls, and Cumulic Haplustolls.

Medina, Alvin L., and H. Dwain Smith. 1986. Designs for an antenna boom and masts for telemetry applications. Wildlife Society Bulletin 14:291-297.

Antenna and mast designs for wildlife telemetry studies, although commercially available, often lack specific information regarding installation, adaptations to the tracting systems, and procedural details of construction. We present detailed construction designs for installing a precision-antenna array and mast assemblies for mobile, portable-fixed, and permanent (fixed) stations.

Ragenovich, I. R.,* J. M. Schmid, D. D. Bennett,* J. W. Barry,* and C. E. Richmond.* 1986. Field evaluations of four insecticides against the pandora moth. Insecticide and Acaricide Tests 11:426.

Four insecticides were aerially applied by helicopter to blocks, 8 hectares in size, along 2 roads east, of Jacob Lake, Arizona, in October 1982. Two 60-cm branch samples were removed from each of 24 trees systematically distributed within each block to estimate larval numbers. Samples were taken just before treatment and 12 and 213 days after treatment.

Rinne, John N., Roger Sorenson,* and Scott C. Belfit.* 1986. An analysis of F1 hybrids between Apache (Salmo apache) and rainbow trout, (Salmo gairdneri). Journal of the Arizona-Nevada Academy of Sciences 20:63-69.

Analysis of two replicate sets of F_1 hybrids (n = 4) between the native Apache and introduced rainbow trouts indicated that overall intermediacy in characters did not occur. Careful case-by-case evaluation of the nature and source of variation in wild trout populations in the West must be given to prevent erroneous taxonomic conclusions and mismanagement of this valuable natural resource.

Rumble, Mark A. 1986. Radiation dosimetry on revegetated uranium mill tailings in western South Dakota. Northwest Science 60(3):145-149.

Measurement of gamma radiation using thermoluminescent dosimeters on three uranium mill tailings areas and a control area showed exposure rates belowground depended on the amount and type of soil covering. Covering tailings with 30 cm of shale and 60 cm of topsoil reduced gamma radiation exposure belowground to rates similar to the control area. Soil covering of 30 cm was adequate to reduce gamma radiation exposure rates aboveground to background levels. Gamma exposure rates to small mammals were correlated to measurements belowground near the surface. Gamma radiation exposure to small mammals inhabiting uranium mill tailings exceeded standards recommended for the general public.

Schmid, J. M., S. A. Mata, and J. C. Mitchell. 1986. Number and condition of seeds in ponderosa pine cones in central Arizona. Great Basin Naturalist 46:449-451.

Ponderosa pine cones from 10 areas in Arizona were collected prior to natural seed dispersal and dissected to determine the number of sound, hollow, and insect-damaged seeds in each cone. Total and sound seed yields per cone did not vary significantly among areas but did vary significantly among trees within each area. Numbers of hollow and *Megastigmus*-infested seeds varied significantly among areas and trees within areas. Numbers of sound seed increased significantly with increasing cone length but did not change with increasing numbers of cones per cluster. The percentages of *Megastigmus*-infested seed did not change significantly with increasing cone length or number of cones per cluster.

Schmid, J. M., J. C. Mitchell, and S. A. Mata. 1986. Ponderosa pine conelet and cone mortality in central Arizona. Great Basin Naturalist 46:445-448.

Ponderosa pine conelets in 10 stands on the Coconino and Kaibab National Forests were observed periodically from July 1982 until they matured in September 1983. Abortion, ponderosa pine cone beetles and ponderosa pine coneworms were the significant mortality factors. Cattle, tip moths, and squirrels rarely destroyed conelets or cones.

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Severson, Kieth E. 1986. Woody plant reestablishment in modified pinyon-juniper woodlands, New Mexico. Journal of Range Management 39(5):438-442.

This paper reports densities of pinyon, junipers, and associated woody species growing where conifers were treated years previously. Treatments included check, thinning, pushing, and pushing and burning. Pinyon-juniper densities increased in check and thin plots but not in pushed plots. Associated woody species were most abundant in untreated plots.

Severson, Kieth E. 1986. Spring and early summer habitats and foods of male blue grouse in Arizona. Journal of the Arizona and Nevada Academy of Science 21:13-18.

Spring and early summer habitats of male blue grouse in eastern Arizona were associated with mixed conifer vegetation dominated by Douglas-fir. Forests stands were relatively heterogeneous, as indicated by variable tree spacing and a range of tree stocking levels and size classes that included both stable (Douglas-fir and white fir) and seral (aspen) species. Densities of tree roost areas varied from 1,347 to 1,477 trees/ha, while stands in general ranged from 694 to 1,300 trees/ha. Large Douglas-firs (18 to 33 m high; 33 to 84 cm d.b.h.) were selected for roosting. Microscopic analyses of feces of male blue grouse showed Douglas-fir needles to be the most prevalent item in diets.

Sommerfeld, R. A., D. Lamb,* and R. Blumenstein.* 1986. Laboratory studies of the interactions of SO_2 and ice. Proceedings of the 23rd conference on radar meteorology and the conference on cloud physics. [Snowmass, Colo., September 22-26, 1986]. American Meteorological Society, Boston, Mass.

Snow on the ground and much liquid precipitation begins as ice crystals formed in the atmosphere. The ability to quantify the amounts of such substances acquired and transported by ice under different conditions is very important in understanding the effects of pollutant source levels on receptor areas in climates where ice processes are important in the atmosphere. This understanding is crucial to the ability to set rational standards for pollution emissions.

Stevens, Robert E. 1986. Life history and habits of Exoteleia anomala Hodges, a ponderosa pine needle miner in the southwestern United States (Gelechiidae). Journal of the Lepidopterists' Society 40(1):23-26.

Exoteleia anomala, the larvae of which mine needles of ponderosa pine in Arizona and New Mexico, has a one-year life cycle similar to that of several species of needle-mining *Coleotechnites*. Each larva requires two needles to complete development. When numerous, larvae can cause highly visible foliage damage, but outbreaks do not appear to persist.

Sturges, David L. 1986. Snow fencing to increase streamflow: Preliminary results. p. 18-29. In: 54th annual meeting western snow conference. [Phoenix, Ariz., April 15-17, 1986] 198 p. Western Snow Conference, Spokane, Wash.

This paper discusses results from a paired watershed study in which a large snow fence was placed on a sagebrush-covered watershed to trap drifting snow and increase water yield. Streamflow and sediment transport characteristics were measured 10 years preceding fence installation and the specific conductance of water was measured for 2 years. Study results are reported here for the first 2 years after fence construction.

Szaro, Robert C., and David R. Patton. 1986. Riparian habitat classification in the southwestern United States. Transactions of the North American Wildlife and Natural Resource Conference 52:215-221.

This paper presents a structural framework of a classification system incorporating community types based on existing vegetation. It will allow managers and/or researchers to make comparisons and management decisions on a statewide or regional basis. Since certain species or combinations of species tend to dominate in any given stand, it is possible to develop a classification based on natural ecological units.

Troendle, C. A., and J. R. Meiman.* 1986. The effect of patch clearcutting on snowpack accumulation and subsequent snowmelt and soil water storage on a subalpine forest slope in Colorado. p. 93-100. In: 54th annual meeting western snow conference. [Phoenix, Ariz., April 15-17, 1986] 198 p. Western Snow Conference, Spokane, Wash.

This paper describes a replicated plot study designed (1) to investigate the effect of a forest opening on the accumulation and melt of the snowpack in both the opening and in the surrounding forest, (2) to determine if any differences in soil moisture recharge between the forest and opening resulted from creation of the opening, and (3) to quantify the evaporative components of the hydrologic cycle for a specific site, to determine how the creation of a small opening altered the water balance.

Uresk, Daniel W. 1986. Food habits of cattle on mixed-grass prairie on the Northern Great Plains. Prairie Naturalist 18(4):211-218.

Six plants made up 82% of the food items found in cattle feces on the wheatgrass-grama-buffalograss type of the northern Great Plains. These forages, in order of importance, were western wheatgrass, blue grama, scarlet globemallow, plains muhly, needle-and-thread, and spike sedge. Grasses accounted for 87% of the diet, forbs 12%, and shrubs 1%. Botanical composition

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of diets changed throughout the grazing season. Preference indices were highest for plains muhly, followed by green needlegrass, sand dropseed, and western wheatgrass. Relationships of diets to available forage was low; similarity indices ranged from 17% to 26%, and rank order correlations were nonsignificant.

Uresk, Daniel W., and Charles E. Boldt.* 1986. Effect of cultural treatments on regeneration of native woodlands on the northern High Plains. Prairie Naturalist 18(4):193-202.

Two cultural treatments were evaluated over a 6-year post-treatment period to determine their effect on regeneration of native woodlands in southwestern North Dakota. Cultural treatments included livestock exclusion and the combination of felling and removal of low-vigor trees and transplanting of woody plants. Shrub density varied by species when grazed and ungrazed treatments were compared. Transplanting of woody plants was successful, and when grazing was excluded, survival of plants improved by about 36%.

Uresk, Daniel W., and Jon C. Charps.* 1986. Denning habitat and diet of the swift fox in western South Dakota. Great Basin Naturalist 46(2):249-253.

Swift fox were investigated in western South Dakota to determine food habits and denning site characteristics. Over a 3-year period, food habitat consisted of mammals, followed by insects, plants, and birds. Dens were located near hilltops within two habitat types, shortgrass and midgrass prairie; each type is characterized by differing plant species. Soil type was not a selective factor for den sites of swift fox. Management considerations for enhancing swift fox populations were presented.

Voorhees, Marguerite E. 1986. Infiltration rate of bentonite mine spoil as affected by amendments of gypsum, sawdust and inorganic fertilizer. Reclamation and Revegetation Research 5:483-490.

Amendment of bentonite mine spoil with sawdust increased the infiltration rate and total cumulative infiltration rate and total cumulative infiltration of water in laboratory tests. Spoil that had been amended with sawdust had absorbed 41, 74 and 75% more water at 2, 24 and 48 h after initial wetting, respectively, than spoil that had not been amended with sawdust. Water had infiltrated sawdust-amended spoil at a rate that was 92%, 259% and 300% greater than the rate of penetration for spoil that had not been so amended during the period of time from 0 to 1 h, from 1 to 2 h and from 2 to 24 h after wetting, respectively. Gypsum or fertilizer amendments (alone or in combination with other amendments) had no significant effect on infiltration.

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Rocky Mountains

Southwest

Great Plains

U.S. Department of Agriculture
Forest Service

Rocky Mountain Forest and Range Experiment Station

The Rocky Mountain Station is one of eight regional experiment stations, plus the Forest Products Laboratory and the Washington Office Staff, that make up the Forest Service research organization.

RESEARCH FOCUS

Research programs at the Rocky Mountain Station are coordinated with area universities and with other institutions. Many studies are conducted on a cooperative basis to accelerate solutions to problems involving range, water, wildlife and fish habitat, human and community development, timber, recreation, protection, and multiresource evaluation.

RESEARCH LOCATIONS

Research Work Units of the Rocky Mountain Station are operated in cooperation with universities in the following cities:

Albuquerque, New Mexico
Flagstaff, Arizona
Fort Collins, Colorado*
Laramie, Wyoming
Lincoln, Nebraska
Rapid City, South Dakota
Tempe, Arizona

*Station Headquarters: 240 W. Prospect St., Fort Collins, CO 80526

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